(3.1) Exploring Quadratic Relations p. 134

What a quadratic graph looks like.
How to determine if an equation is either linear, quadratic or neither; using equations, graphs and tables.

What we know:

$y = mx + b$ is a _____ relation

What we will learn:

$y = ax^2 + bx + c$ is a _____ relation

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(3.1) Exploring Quadratic Relations p. 134

What a quadratic graph looks like.
How to determine if an equation is either linear, quadratic or neither; using equations, graphs and tables.

Degree = 1

What we know:

$y = mx^1 + b$ is a linear relation

Degree = 2

What we will learn:

$y = ax^2 + bx + c$ is a quadratic relation

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Quadratic Relation in Standard Form:

$$y = ax^2 + bx + c$$

independent variable

dependent variable

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Quadratic Relation in Standard Form:

$$y = ax^2 + bx + c$$

independent variable x

dependent variable y

economics

gravity - projectiles

engineering

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Degree of a Polynomial

➡ the greatest sum of the exponents in any one term

Determine the degree of the following polynomials:

a) $5x^2y + 4x^3y^2 - 3x$

b) $y = 5x + 2$

c) $y = x^2 + 7x - 2$

d) $x^2 + y^2 = 49$

A polynomial of degree 2 **MAY** be quadratic.

A polynomial of degree other than 2 is **NOT** quadratic.

Quadratic relations have degree 2.

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Degree of a Polynomial

➡ the greatest sum of the exponents in any one term

Determine the degree of the following polynomials:

a) $5x^2y + 4x^3y^2 - 3x$ Degree = 3

b) $y = 5x^1 + 2$ Degree = 1 - linear

c) $y = x^2 + 7x - 2$ Degree = 2 - quadratic

d) $x^2 + y^2 = 49$ Degree = 2

$y^2 = 49 - x^2$

A polynomial of degree 2 **MAY** be quadratic.

A polynomial of degree other than 2 is **NOT** quadratic.

Quadratic relations have degree 2.

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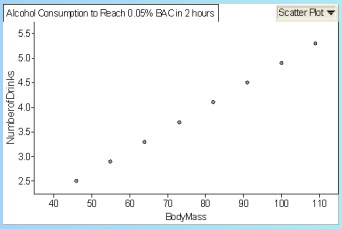
(3.1) Exploring Quadratic Relations

Part 1: Blood Alcohol Content

Drinking and driving is one of the major causes of vehicle accidents. A driver's blood alcohol content (BAC) depends on body mass and the amount of alcohol consumed. The table shows the number of standard-size drinks that produce a BAC of 0.05% within a 2-hour period.

Alcohol Consumption to Reach 0.05% BAC in 2 hours

	BodyMass	NumberofDrinks	FirstDifference
1	46	2.5	
2	55	2.9	
3	64	3.3	
4	73	3.7	
5	82	4.1	
6	91	4.5	
7	100	4.9	
8	109	5.3	



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(3.1) Exploring Quadratic Relations

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Alcohol Consumption to Reach 0.05% BAC in 2 hours

	BodyMass	NumberofDrinks	FirstDifference
1	46	2.5	0.4
2	55	2.9	0.4
3	64	3.3	0.4
4	73	3.7	0.4
5	82	4.1	0.4
6	91	4.5	
7	100	4.9	
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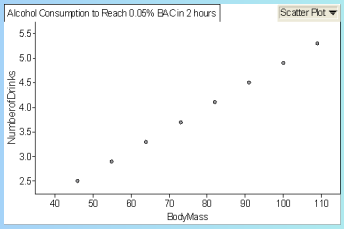
$y_2 - y_1$

Linear



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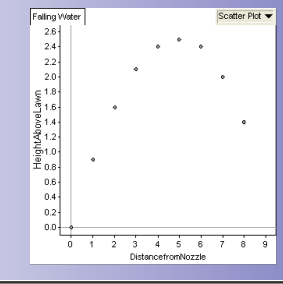
Part 2: Falling Water

A garden hose sprays a stream of water across a lawn. The table records the approximate height of the stream above the lawn at various distances from the nozzle.

Falling Water

	DistancefromNozzle	HeightAboveLawn	FirstDifference	SecondDifference
1	0	0		
2	1	0.9		
3	2	1.6		
4	3	2.1		
5	4	2.4		
6	5	2.5		
7	8	2.4		
8	7	2		
9	8	1.4		



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Part 2: Falling Water

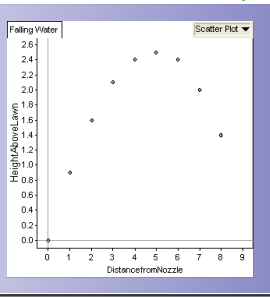
A garden hose sprays a stream of water across a lawn. The table records the approximate height of the stream above the lawn at various distances from the nozzle.

Falling Water

	DistancefromNozzle	HeightAboveLawn	FirstDifference	SecondDifference
1	0	0	0.9	−0.2
2	1	0.9	0.7	−0.2
3	2	1.6	0.5	−0.2
4	3	2.1	0.3	−0.2
5	4	2.4	0.1	−0.2
6	5	2.5	−0.1	
7	8	2.4	−0.3	same
8	7	2	−0.7	
9	8	1.4		

Non Linear

Quadratic Degree = 2



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Examining $y = ax^2 + bx + c$.

How does changing a, b and c effect the graph?

Graph:

1. $y = x^2$ "Parent" or "Basic" Graph
2. $y = 0.5x^2 + 2x + 1$

Can we tell what a, b and c do to the graph?

No! So let's look at changing each one at a time.

"a" "b" "c"

Effect of changing:

a	large values – stretch fractional values – compress -ve values – reflect
b	change the line of symmetry +ve values shift up -ve values vertically down
c	

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Notice: $y = mx + b$

$y = ax^2 + bx + c$

$y = ax^2 + bx + c$

a = larger than 1 – stretched
less than 1 – Compressed
= -ve – points down (reflected)

C = +ve shifted up

C = -ve shifted down

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Homework

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